REMARKS

I. Introduction

Claims 1-20, 22, 23, 26-29, 38-40 and 43-55 are pending. Claims 1, 11, 40 and 43 are independent claims. Claims 41-42 have been cancelled. Claims 26-29 have been amended. New claims 43-55 have been added. No new matter was added. The pending claims 11-20, 22, 23, 26-29 and 38-40 and 43-55 are reproduced above.

Applicants thank Examiner Miller for the courtesy extended to Applicants' representatives in conducting a personal interview on December 13, 2001. During the interview, the Examiner indicated that claims 41-42 were directed to a different device than claims 11 and 40, and that claims 41-42 would be restricted unless they were amended to recite the same device as claims 11 and 40.

In reply, claims 41 and 42 have been cancelled and new claims 43-55 have been added as discussed during the interview. Independent claim 43 recites a magnetoresistance effect element comprising a spin valve film, as do claims 11 and 40. Claim 43 contains every element of claim 11. Claim 43 further recites that the first ferromagnetic layer consists essentially of CoFe, as was previously recited in claim 41. New dependent claims 44-55 recite the same limitations as previously pending dependent claims 12-17, 19-20, 22-23 and 38-39. Thus, Applicants respectfully submit that claims 43-55 should be examined together with claims 11 and 40.

Furthermore, independent claim 26 has been rewritten in dependent form to depend from claim 11 in order to avoid a restriction requirement. Applicants respectfully reserve the right present independent claims 26 and 41 in the future.

Applicants respectfully submit that independent claims 11, 40 and 43 and claims which depend therefrom are in condition for allowance in view of the follow comments.

II. The § 103(a) rejection should be withdrawn in view of unexpected results

In the Office Action, claims 11-20, 22, 23, 26-29 and 38 were rejected under 35 U.S.C § 103(a) as being unpatentable over Dieny et al. ("Dieny") in view of Lin et al. ("Lin"). This rejection is respectfully traversed.

A. Claims 11-20, 22, 23 and 38-40

Dieny discloses a SVMR element having a NiMn or FeMn antiferromagnetic layer. The Office Action asserts that the motivation for substituting the NiMn or FeMn antiferromagnetic layer of Dieny with a PtMn antiferromagnetic layer of Lin is that PtMn and NiMn have a similar Neel and blocking temperature, but PtMn provides an improved corrosion resistance.

However, neither Dieny nor Lin realized that the MR ratio in a spin valve magnetoresistance (SVMR) element is significantly improved by substituting the NiMn antiferromagnetic layer with PtMn layer. Thus, the addition of a PtMn alloy as the antiferromagnetic layer in a SVMR element provides an unexpected result which rebuts any prima facie case of obviousness that is allegedly established in the Office Action.

1. Iwasaki Declaration (Exhibit 1)

Applicants resubmit the Rule 1.132 Declaration of Mr. Hitoshi Iwasaki (Exhibit 1), one of the co-inventors of the present application. This Declaration was previously

submitted in the parent application on 10/18/99. As shown in the declaration, the use of a PtMn antiferromagnetic layer in a SVMR element significantly improves the MR ratio of the element compared to the NiMn or FeMn antiferromagnetic layers disclosed by Dieny.

For example, Mr. Iwasaki's Declaration shows that by using Dieny's NiMn and FeMn antiferromagnetic layers in a SVMR element provides an MR ratio of 3.7% and 3.9%, respectively. However, when the NiMn or FeMn layer in the identical SVMR element is substituted with a PtMn layer, the MR ratio dramatically increases to 7%. This result is not expected from the disclosure of Dieny or Lin.

2. Exhibit 2

Applicants also resubmit the three page exhibit (Exhibit 2) that was discussed during the interview illustrating a possible reason for the unexpected increase in MR ratio with the use of a PtMn antiferromagnetic layer. As shown on page 1 of Exhibit 2, the Applicants noted that the MR ratio markedly depends on the structure at the interfaces between the spacer and ferromagnetic layers. In contrast, the structure at the interfaces does not significantly influence the MR ratio in an AMR device (see page 2 of Exhibit 2).

Applicants believe that the FeMn and NiMn antiferromagnetic layers of Dieny provide a source of Mn atoms that diffuse through the grain boundaries to the interface of the ferromagnetic and spacer layers (see page 3 of Exhibit 2). These diffused Mn atoms degrade the interface between the pinned ferromagnetic layer and the spacer layer, and lower the MR ratio of the SVMR device. In contrast, Applicants believe that the Mn atoms do not diffuse through the grain boundaries to the interface of the ferromagnetic and spacer layers from the claimed PtMn antiferromagnetic layer. Thus, the interface between

the pinned ferromagnetic layer and the spacer layer is not degraded by the Mn atom diffusion, and a high MR ratio is maintained in the claimed SVMR device.

3. Summary

Therefore, the unexpected results presented in the Declaration and explained in Exhibit 2 are considered sufficient to overcome the § 103(a) rejection. A withdrawal of the rejection is respectfully requested.

C. Claims 43-55

Claim 43 contains every limitation of claim 11. Therefore, claim 43 is respectfully submitted to be in condition for allowance because of the unexpected results discussed with respect to claim 11.

Furthermore, claim 43 is respectfully submitted to be in condition for allowance for the following additional reason. Claim 43 recites that the first ferromagnetic layer consists essentially of FeCo. In contrast, Dieny does not teach using a FeCo ferromagnetic layer in the SVMR element (see col. 3, line 65 – col. 4, line 6 of Dieny for a list of ferromagnetic layers taught by Dieny). Applicants note that the claimed ferromagnetic layer which consists essentially of FeCo excludes the NiFeCo ferromagnetic layer of Dieny. Lin provides no motivation for using a FeCo ferromagnetic layer in the SVMR element of Dieny.

Furthermore, as shown in Mr. Iwasaki's Declaration, when the FeCo ferromagnetic layers are used in combination with a PtMn antiferromagnetic layer, a large increase in the MR ratio of a SVMR element occurs compared to when NiMn or FeMn antiferromagnetic

layers are used with the FeCo ferromagnetic layer. As discussed above, this result is clearly unexpected from the disclosures of Dieny or Lin.

III. Conclusion

In view of the foregoing, applicants respectfully submit that the pending claims are in condition for allowance. An early notice to this effect is earnestly solicited. Should there be any questions concerning this application, Examiner Miller is invited to contact the undersigned at the number listed below.

Respectfully submitted,

12/28/01
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Should additional fees be necessary in connection with the filing of this paper, or if a petition for extension of time is required for timely acceptance of same, the Commissioner is hereby authorized to charge Deposit Account No. 19-0741 for any such fees; and applicant(s) hereby petition for any needed extension of time.

REDLINED VERSION OF CLAIMS TO SHOW CHANGES MADE

26. (Amended) A magnetoresistance effect element as set forth in claim 11, wherein [, comprising

an exchange coupled film having a first ferromagnetic layer and an antiferromagnetic layer, the antiferromagnetic layer being on the first ferromagnetic layer, and the exchange coupled film being] the antiferromagnetic layer is substantially free of corrosive pits, when the [exchange film] antiferromagnetic layer is exposed to an atmosphere having a relative humidity of 90%, at a temperature of 90 degrees centigrade for a time duration of 48 hours.

27. (Amended) A magnetoresistance effect element as set forth in claim 26, wherein the [exchange coupled film] antiferromagnetic layer has less than a 10% probability for occurrence of corrosive pits.

28. (Amended) A magnetoresistance effect element as set forth in claim 26 wherein the antiferromagnetic layer consists essentially of PtMn [comprises an alloy of NMn, where N is at least one element selected from the group consisting of Cu, Ru, Rh, Re, Pd, Pt, Ag, Au, Os, and Ir].